

CLAIMS

1. A chemical mixing device, comprising:

a flow generator operative to provide at least two streams of chemicals; and

5 a mixing chamber, including at least two inlets adapted to receive the at least two streams of chemicals and an outlet through which a mixture of the streams of chemicals is ejected from the mixing device,

wherein the mixing chamber has an open state in which the chemicals are mixed and a closed state in which the volume of the mixing chamber is less than a fifth of the open state
10 volume.

2. A mixing device according to claim 1, wherein the mixing chamber has a substantially zero volume in the closed state.

15 3. A mixing device according to claim 1, wherein the mixing chamber has walls that are biased in a closed state in which the walls are pressed against each other.

4. A mixing device according to claim 3, wherein the walls of the mixing chamber are biased in the closed state by a pressure greater than required to keep the mixing chamber in the
20 closed state.

5. A mixing device according to claim 1, wherein the mixing chamber has a volume smaller than a cubic millimeter in the closed state.

25 6. A mixing device according to claim 1, wherein the mixing chamber has a volume of less than 20 cubic millimeters in the open state.

7. A mixing device according to claim 1, wherein the mixing chamber remains in the closed state when the flow generator does not operate.

30 8. A mixing device according to claim 1, wherein the pressure of the streams of chemicals move the mixing chamber into the open state.

9. A mixing device according to claim 1, wherein the mixing chamber comprises a flexible material.

10. A mixing device according to claim 9, wherein the mixing chamber comprises a
5 compressible material.

11. A mixing device according to claim 9, wherein the mixing chamber material has a hardness of less than 60 shore A.

10 12. A mixing device according to claim 9, comprising a rigid structure which continuously applies a closing force to the mixing chamber.

13. A mixing device according to claim 9, comprising an elastic ring which continuously applies a closing force to the mixing chamber.

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14. A mixing device according to claim 9, comprising a pressure unit which controllably applies a closing pressure on the mixing chamber, when the mixing chamber is in the closed state, but does not apply the closing pressure when the mixing chamber is to be in the open state.

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15. A mixing device according to claim 1, wherein the flow generator and a nozzle containing the mixing chamber are connected to each other and are adapted to be replaced together.

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16. A mixing device according to claim 1, wherein a nozzle containing the mixing chamber and containers from which the flow generator extracts the chemicals are adapted to be replaced together.

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17. A mixing device according to claim 1, comprising at least two channels which lead the chemicals to the mixing chamber, wherein the channels have a decreasing cross-section as they approach the mixing chamber.

18. A mixing device according to claim 1, comprising at least two channels which lead the chemicals to the mixing chamber, wherein at least a portion of the channels is held in a closed state when the flow generator does not operate.

5 19. A mixing device according to claim 18, wherein a pressure holding the channels closed is greater than a pressure holding the mixing chamber in the closed state.

20. A mixing device according to claim 19, wherein the pressure holding the channels closed gradually decreases along the channels as the channels approach the mixing chamber.

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21. A mixing device according to claim 19, wherein the pressure holding the channels closed varies due to variations in the walls of the channels.

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22. A mixing device according to claim 19, wherein the pressure holding the channels closed varies due to variations in an external member that applies pressure to the walls of the channels.

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23. A mixing device according to claim 1, wherein walls of the mixing chamber are pressed against each other in the closed state.

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24. A mixing device according to claim 23, wherein walls of the mixing chamber are pressed against each other in the closed state, by an external force.

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25. A chemical mixing device, comprising:

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a flow generator operative to provide at least two streams of chemicals; and

a mixing chamber, including at least two inlets adapted to receive the at least two streams of chemicals and an outlet through which a mixture of the streams of chemicals is ejected,

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wherein the volume of the mixing chamber from a first mixing point of the streams to the outlet is not greater than 20 cubic millimeters.

26. A mixing device according to claim 25, wherein a length of the mixing chamber from the inlets to the outlet is not longer than 15 millimeters.

27. A mixing device according to claim 25, wherein the flow generator is adapted to provide the streams at a sufficient pressure such that when the streams reach the first mixing point they have a pressure sufficient to push out of the mixing chamber foam remnants filling the entire mixing chamber.
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28. A mixing device according to claim 25, wherein a cross section of the mixing chamber increases monotonically from the first mixing point to the outlet.
- 10 29. A mixing device according to claim 25, wherein a cross section of the mixing chamber is substantially constant from the first mixing point to the outlet.
- 15 30. A mixing device according to claim 25, comprising a pressure valve which prevents at least one of the chemical streams from reaching the first mixing point, unless the stream applies a pressure above 3 bar.
31. A mixing device according to claim 25, wherein the mixing chamber material has a hardness of less than 40 shore A.
- 20 32. A mixing device according to claim 25, wherein the mixing chamber material has a hardness of less than 60 shore A.
33. A mixing device according to claim 25, wherein the mixing chamber is formed of a material which does not stick to polyurethane foam.
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34. A mixing device according to claim 25, wherein the mixing chamber has an average cross section area of less than 10 square millimeters.
35. A chemical mixing device, comprising:
- 30 a flow generator operative to provide at least two streams of chemicals; and a mixing chamber, including at least two inlets adapted to receive the at least two streams of chemicals and an outlet through which a mixture of the streams of chemicals is ejected,

wherein the mixing chamber is formed of a flexible material.

36. A mixing device according to claim 35, wherein the mixing chamber is formed of a material to which polyurethane foam does not stick.

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37. A mixing device according to claim 35, wherein the mixing chamber material has a hardness of less than 60 shore A.

10 38. A mixing device according to claim 35, comprising an external pressure applicator which continuously applies a closing pressure to the mixing chamber.

39. A mixing device according to claim 35, wherein the mixing chamber is formed as a single piece with at least two chemical leading channels for leading chemicals to the mixing chamber.

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40. A chemical mixing device, comprising:

a flow generator operative to provide at least two streams of chemicals; and

20 a mixing chamber, including at least two inlets adapted to receive the at least two streams of chemicals and an outlet through which a mixture of the streams of chemicals is ejected; and

a flow regulator which prevents flow into the mixing chamber unless the chemical streams from the flow generator have a pressure above a threshold of at least 2 bar.

41. A mixing device according to claim 40, wherein the flow regulator comprises portions 25 of flexible channels leading chemicals to the mixing chamber which are pressed into a closed position.

42. A mixing device according to claim 40, wherein the flow regulator prevents flow into the mixing chamber unless the chemical streams from the flow generator have a pressure 30 above a threshold of at least 4 bar.

43. A chemical mixing device, comprising:

a flow generator operative to provide at least two streams of chemicals;

a mixing chamber, including at least two inlets adapted to receive the at least two streams of chemicals and an outlet through which a mixture of the streams of chemicals is ejected; and

5 at least two channels having a decreasing cross section area, adapted to lead the chemical streams to the inlets of the mixing chamber.

44. A mixing device according to claim 43, wherein one or more of the at least two channels have a monotonically non-increasing cross section over adjacent the inlet of the mixing chamber.

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45. A mixing device according to claim 43, wherein one or more of the at least two channels have a cross-section which decreases by at least a factor of 2, from an entrance of chemicals to the channels, to the inlet of the mixing chamber.

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46. A mixing device according to claim 43, wherein one or more of the at least two channels has a cross-section of less than 3 square millimeters at the inlet to the mixing chamber.

47. A foam dispensing device, comprising:

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a plurality of input tubes adapted to receive chemicals;

a mixing chamber having at least one elastic wall; and

a flow generator adapted to induce flow of the chemicals received from the input tubes into the mixing chamber,

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wherein the mixing chamber has a first volume when the flow generator is not operating, and a second, larger volume when the flow generator induces flow of the chemicals into the mixing chamber.

48. A device according to claim 47, wherein the plurality of input tubes receive chemicals from containers included in a casing of the dispensing device.

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49. A device according to claim 47, wherein the plurality of input tubes receive chemicals from containers not mounted on the dispensing device.

50. A device according to claim 47, wherein the flow generator comprises a pump.

51. A device according to claim 47, wherein the pump comprises a gear pump.

5 52. A device according to claim 47, wherein the at least one elastic wall closes the path from the input tubes to the mixing chamber.

53. A device according to claim 47, wherein the mixing chamber has a large opening to the environment.

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54. A kit for replacement of a mixing chamber of a dispensing gun, comprising:
a package;
a mixing chamber, within the package; and
a flow generator connected to the mixing chamber, within the package.

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55. A kit according to claim 54, wherein the flow generator and mixing chamber are connected such that they require use of tools for separation.

20 56. A kit according to claim 54, comprising at least one chemical container included in the package, connected to the flow generator.

25 57. A kit for replacement of a mixing chamber of a dispensing gun, comprising:
a package;
a nozzle defining a mixing chamber, within the package; and

at least one chemical container connected to the nozzle, within the package.